

PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of : Leslie ROSS
Serial no. :
Filed :
For : COMPOSITE SHEET MATERIAL
Group Art Unit :
Examiner :
Docket : BSG P65AUS

The Commissioner for Patents
P. O. Box 1450
Alexandria, VA 22313-1450

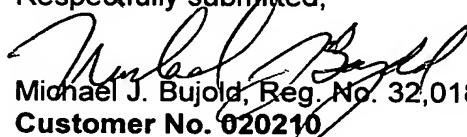
SUBMISSION OF CERTIFIED COPY

Dear Sir:

A claim for priority is hereby made under the provisions of 35 U.S.C. § 119 for the above-identified United States Patent Application based upon Great Britian Patent Application No. 0225937.2 filed November 6, 2002. A certified copy of said Great Britian application is enclosed herewith.

In the event that there are any fee deficiencies or additional fees are payable, please charge the same or credit any overpayment to our Deposit Account (Account No. 04-0213).

Respectfully submitted,


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INVESTOR IN PEOPLE

The Patent Office
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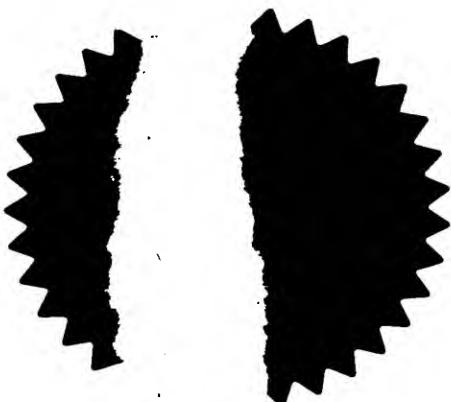
USA

I, the undersigned, being an officer duly authorised in accordance with Section 74(1) and (4) of the Deregulation and Contracting Out Act 1994, to sign and issue certificates on behalf of the Comptroller-General, hereby certify that annexed hereto is a true copy of the documents as originally filed in connection with the patent application identified therein together with the Statement of inventorship and of right to grant of a Patent (Form 7/77), which was subsequently filed.

In accordance with the Patents (Companies Re-registration) Rules 1982, if a company named in this certificate and any accompanying documents has re-registered under the Companies Act 1980 with the same name as that with which it was registered immediately before re-registration save for the substitution as, or inclusion as, the last part of the name of the words "public limited company" or their equivalents in Welsh, references to the name of the company in this certificate and any accompanying documents shall be treated as references to the name with which it is so re-registered.

In accordance with the rules, the words "public limited company" may be replaced by p.l.c., plc, P.L.C. or PLC.

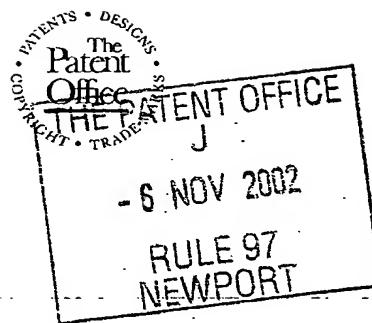
Re-registration under the Companies Act does not constitute a new legal entity but merely subjects the company to certain additional company law rules.



Signed

Dated 20 October 2003

Stephen Hordley

**Statement of inventorship and of right to grant of a patent**

The Patent Office

Cardiff Road
Newport
South Wales
NP10 8QQ

1. Your reference

BO72

2. Patent application number
(if you know it)

06 NOV 2002

0225937.2

3. Full name of the or of each applicant

Britax Aircraft Interiors UK Limited

4. Title of the invention

COMPOSITE SHEET MATERIAL

5. State how the applicant(s) derived the right from the inventor(s) to be granted a patent

Leslie Ross is an employee of Britax Aircraft Interiors UK Limited and the invention is the property of the applicants by virtue of the terms of the inventor's employment.

6. How many, if any, additional Patents Forms 7/77 are attached to this form?
(see note (c))

None

7.

I/We believe that the person(s) named over the page (*and on any extra copies of this form*) is/are the inventor(s) of the invention which the above patent application relates to.

Signature

Date

A. Hollinghurst, Agent for the Applicants

5th November 2002

8. Name and daytime telephone number of person to contact in the United Kingdom

A Hollinghurst 01264 386 006

Notes

- a) If you need help to fill in this form or you have any questions, please contact the Patent Office on 08459 500505.
- b) Write your answers in capital letters using black ink or you may type them.
- c) If there are more than three inventors, please write the names and addresses of the other inventors on the back of another Patents Form 7/77 and attach it to this form.
- d) When an application does not declare any priority, or declares priority from an earlier UK application, you must provide enough copies of this form so that the Patent Office can send one to each inventor who is not an applicant.
- e) Once you have filled in the form you must remember to sign and date it.

Enter the full names, addresses and postcodes of the inventors in the boxes and underline the surnames:-

Leslie ROSS

74 Lakeside Road
Ash Vale
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GU12 5AA

Patents ADP number (*if you know it*):

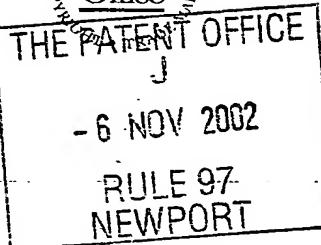
072 5922 8001

Patents ADP number (*if you know it*):

Reminder

Have you signed the form?

Patents ADP number (*if you know it*):

07NOV02 E761579-2 D00811
P01/7700 0.00-0225937.2**Request for grant of a patent**

(See the notes on the back of this form. You can also get an explanatory leaflet from the Patent Office to help you fill in this form)

The Patent Office

Cardiff Road
Newport
South Wales
NP10 8QQ

1. Your reference

BO72

2. Patent application number

(The Patent Office will fill in this part)

06 NOV 2002

0225937.2

3. Full name, address and postcode of the or of each applicant (underline all surnames)Britax Aircraft Interiors UK Limited
Seton House
Warwick Technology Park
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Warwick, CV34 6DE

Patents ADP number (if you know it)

4620196001
GB

08243479001

4. Title of the invention

COMPOSITE SHEET MATERIAL

5. Name of your agent (if you have one)

"Address for service" in the United Kingdom to which all correspondence should be sent (including the postcode)

Antony Hollinghurst
Britax Childcare Limited
1 Churchill Way West
Andover
Hampshire
SP10 3UW

Patents ADP number (if you know it)

0856009185001

6. If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or of each of these earlier applications and (if you know it) the or each application number

Country

Priority application number
(if you know it)Date of filing
(day / month / year)

7. If this application is divided or otherwise derived from an earlier UK application, give the number and the filing date of the earlier application

Number of earlier application

Date of filing
(day / month / year)

8. Is a statement of inventorship and of right to grant of a patent required in support of this request? (Answer 'Yes' if:

a) any applicant named in part 3 is not an inventor, or

b) there is an inventor who is not named as an applicant, or

c) any named applicant is a corporate body.

See note (d))

Yes

Patents Form 1/77

9. Enter the number of sheets for any of the following items you are filing with this form.
Do not count copies of the same document

Continuation sheets of this form

Description

3

Claim(s)

Abstract

Drawing(s)

1

10. If you are also filing any of the following, state how many against each item.

Priority documents

Translations of priority documents

Statement of inventorship and right to grant of a patent (*Patents Form 7/77*)

1 x 1

Request for preliminary examination and search (*Patents Form 9/77*)

Request for substantive examination
(*Patents Form 10/77*)

Any other documents
(please specify)

11.

I/We request the grant of a patent on the basis of this application.

Signature

Date

A. Hollinghurst, Agent for the Applicants

5th November 2002

12. Name and daytime telephone number of person to contact in the United Kingdom

A Hollinghurst 01264 386 006

Warning

After an application for a patent has been filed, the Comptroller of the Patent Office will consider whether publication or communication of the invention should be prohibited or restricted under Section 22 of the Patents Act 1977. You will be informed if it is necessary to prohibit or restrict your invention in this way. Furthermore, if you live in the United Kingdom, Section 23 of the Patents Act 1977 stops you from applying for a patent abroad without first getting written permission from the Patent Office unless an application has been filed at least 6 weeks beforehand in the United Kingdom for a patent for the same invention and either no direction prohibiting publication or communication has been given, or any such direction has been revoked.

Notes

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COMPOSITE SHEET MATERIAL

This invention relates to composite sheet material of the type comprising a core formed from cellular material having a respective skin of continuous sheet material on each side thereof.

The term "cellular material" is used herein to mean a solid material containing air-filled or gas filled voids, for example, honeycomb or foam material.

In a known composite material of this type, the honeycomb material comprises paper honeycomb impregnated with a phenolic lacquer resin. Each skin comprises a glass fibre mat also impregnated with phenolic resin. The skins are secured to the core using an epoxy based film adhesive. When the resin is cured, a piece of such composite material comprises a lightweight rigid panel which is particularly suitable for use in aircraft cabin interiors.

However, this material suffers from the disadvantage that, once the resin has cured, the resulting panel is permanently rigid. If it is desired to form radii or rebates in the material, it is necessary to make cuts in the skin on the inside of such a radius in order to allow the material to be bent. After the required radius has been formed, it is necessary for the cuts in the skin to be "glassed over" with phenolic resin.

Another disadvantage is that the skins tend to delaminate in use, particularly when adhesive tape is used to secure carpet to such material. When the tape is pulled off, the surface of the skin is pulled away, exposing some of the glass fibres. Subsequent application of adhesive tape to the damaged area results in such tape adhering directly to the exposed glass fibres. On the next occasion time when the carpet is removed, such exposed glass fibres tend to pull away with the tape, thus causing further delamination.

It is an object of the invention to provide a

composite material which is not subject to these disadvantages.

According to the invention, in a composite material of the type described above, both the cellular core 5 and the skins are formed of thermoplastic materials and the skins are attached to the core by a thermoplastic adhesive having a fusion temperature less than that of both the core and the skins.

The effect of this is that if the material is 10 heated to above the fusion temperature of the adhesive and then bent to form a radius therein, the skins move relative to the core rather than the skin on the outside of the radius being stretched and the skin on the inside of the radius being compressed. When the material has cooled, the 15 two skins form continuous smooth surfaces round the radius and no subsequent glassing is necessary.

An embodiment of the invention will now be described, by way of example, with reference to the accompanying drawings, in which:

20 Figure 1 is an edge view of a panel formed from composite material in accordance with the invention; and

Figure 2 is a plan view of the panel shown in Figure 1 with part of the upper skin removed.

The drawing shows a panel 10 formed from a 25 honeycomb core 12 having the ends of the honeycomb cells covered by respective skins 14 and 16 which are secured to the core 12 by respective layers 18 and 20 of thermoplastic adhesive.

The core 12 is formed from extruded tubes of 30 polyetherimid and may, for example comprise Trauma-Lite Honeycombs Type PEI 3.5-70 supplied by Trauma-Lite Limited, PO Box 456, Manchester M62 LL, United Kingdom. In this material, the diameter of the tubes is 3.5 mm and the material density is 70 kilos per cubic metre. This material 35 can be thermoformed at temperatures up to 170°C.

The skins 14 and 16 may comprise Cetex GI0303

reinforced thermoplastic laminate, supplied by Ten Cate Advanced Composites, Campbellweg 30, 7443 PV Nijverdal, Netherlands. This material is in accordance with Boeing Aircraft Corporation's Material Specification BMS8-353 and 5 can be thermoformed at temperatures in the range 150°C to 300°C.

The thermoplastic adhesive may be a polyester based thermoplastic web such as Sharnet Web Sh4275 supplied by Bostic Findley Limited, Alderscote Road, Leicester LE4 10 68W, England. This has a fusion temperature of 130°C.

Consequently, the preferred temperature for bending and shaping composite material made from these materials is 150°C.

When it is desired to bend the material, an entire 15 panel is heated (for example in an oven) heated to a temperature between the fusion temperature of the adhesive and the fusion temperatures of the core and the skins. The panel is then bent to form a radius therein. The skins move relative to the core so that the skin on the outside of the 20 radius no longer reaches the edge of the core while the skin on the inside of the radius projects beyond the edge of the core. When the material has cooled, the two skins form continuous smooth surfaces round the radius and no 25 subsequent glassing is necessary. Finally, the edges of the panel are cut away to the required peripheral shape, thereby removing surplus skin and those parts of the core that are no longer covered by skin on both sides.

If a component formed from a composite material in accordance with the invention is damaged, the damaged 30 material may be cut away and replaced by fresh material which is bonded into place with the use of a hot iron. This type of repair can be performed within an aircraft cabin, avoiding the need to remove the relevant equipment from the aircraft.

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Fig. 1

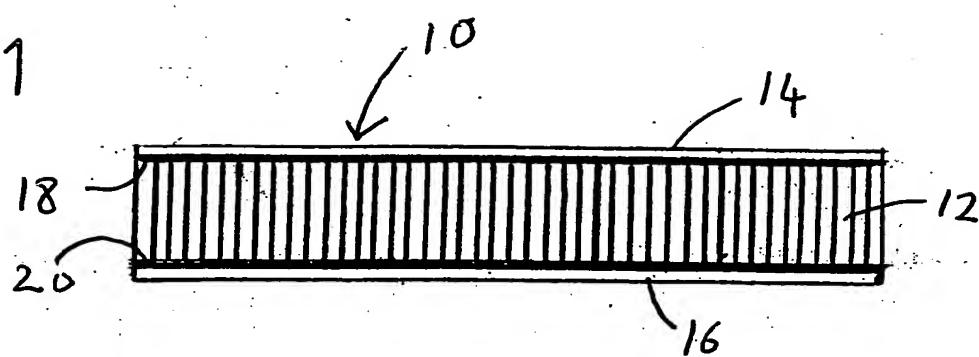


Fig. 2

